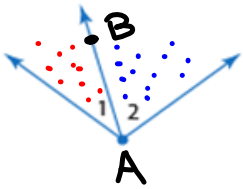
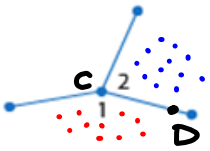
Adjacent angles: two angles that lie in the same plane and have a common vertex and a common side but no common interior points.

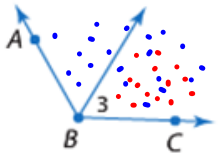
Examples $\angle 1$ and $\angle 2$ are adjacent angles. **Nonexamples** $\angle 3$ and $\angle ABC$ are nonadjacent angles



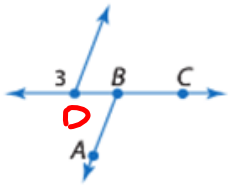
- have common vertex A.
- have a common side $\overrightarrow{AB}$.
- no common interior points.



- common vertex C.
- common side $\overrightarrow{CD}$.
- no common interior points



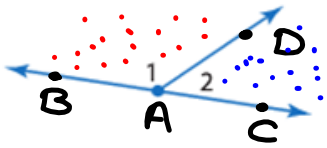
- common vertex B
- common side $\overrightarrow{BC}$.
- have common interior points



- different vertices

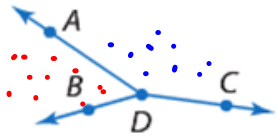
Linear pair: a pair of adjacent angles with noncommon sides that are opposite rays.

Example $\angle 1$ and $\angle 2$



- Common vertex A
- Common side $\overrightarrow{AD}$
- no common interior points
- B, A, C are collinear
- $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are opposite rays.

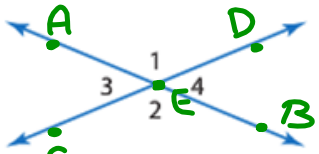
Nonexample $\angle ADB$ and $\angle ADC$



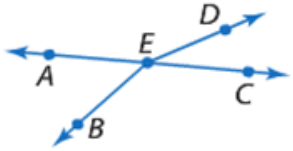
- Common vertex D
- Common side $\overrightarrow{DA}$
- no common interior points
- B, D, C are not collinear
- $\overrightarrow{DB}$ and $\overrightarrow{DC}$ are not opposite rays

Vertical angles: two nonadjacent angles formed by two intersecting lines.

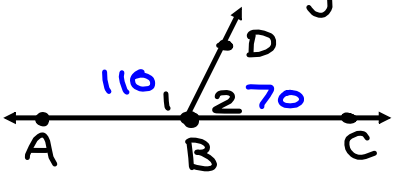
Examples ∠1 and ∠2; ∠3 and ∠4



Nonexample ∠AEB and ∠DEC

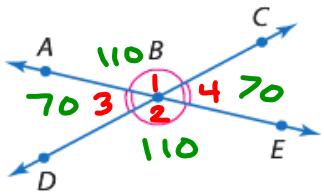


Pairs of Vertical angles are congruent ≅



m∠ABC = 180 (straight angle)

m∠1 + m∠2 = 180 by angle addition postulate

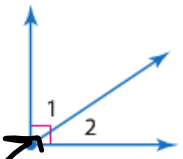


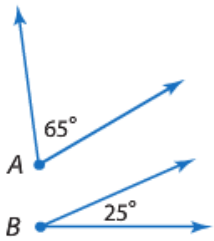
∠ABC ≅ ∠DBE

∠ABD ≅ ∠CBE

Complementary angles: two angles with measures that have a sum of 90°.

∠1 and ∠2 are complementary:
- adjacent
- symbol for right angle

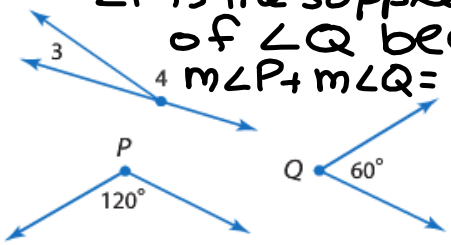




∠A is the complement of ∠B:
- nonadjacent
- m∠A + m∠B = 65 + 25 = 90

Supplementary angles: two angles with measures that have a sum of 180°.

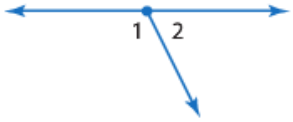
∠3 and ∠4 are supplementary:
- linear pair



∠P is the supplement of ∠Q because m∠P + m∠Q = 120 + 60 = 180

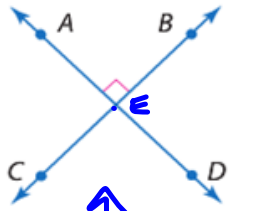
The angles in a linear pair are Supplementary.

m∠1 + m∠2 = 180



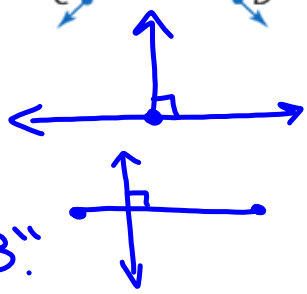
Perpendicular: lines, segments, or rays that intersect to form right angles.

- Perpendicular lines intersect to form four right angles.
- Perpendicular lines intersect to form congruent adjacent angles.
- Segments and rays can be perpendicular to lines or other line segments and rays.
- The right angle symbol in the figure indicates that the lines are perpendicular.



Symbol $\perp$ is read *is perpendicular to.* **Example** $\overleftrightarrow{AD} \perp \overleftrightarrow{CB}$

"line AD is perpendicular to line CB."



ex. 1. Find the measures of two supplementary angles if the difference in the measures of the two angles is 18.

L = measure of the 1st angle

$180 - L$ = measure of the 2nd angle

$(180 - L) - (L) = 18$

$180 - L - L = 18$

$180 - 2L = 18$

$-180 \downarrow \quad -180$

$\frac{-2L}{-2} = \frac{-162}{-2}$

$L = 81$

$L = 81$

$180 - L = 180 - 81 = 99$

The two angles measure 99 and 81.

ex. 2. Find the measures of two complementary angles if the measure of the larger angle is 12 more than twice the measure of the smaller angle.

m = smaller angle

$2m+12$ = larger angle

$(m)+(2m+12)=90$

$m+2m+12=90$

$3m+12=90$

$-12 \quad -12$

$\frac{3m}{3} = \frac{78}{3}$

$m=26$

$m=26$

$2m+12=2(26)+12$

$52+12$

64

The two angles measure 26 and 64

ex. 3. Find x and y so that $\overline{PR}$ and $\overline{SQ}$ are perpendicular.

$\overline{PR} \perp \overline{SQ}$

$(2x)+(5x+6)=90$

$2x+5x+6=90$

$7x+6=90$

$-6 \quad -6$

$\frac{7x}{7} = \frac{84}{7}$

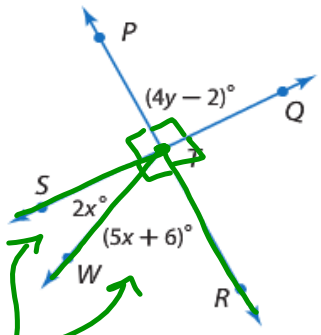
$x=12$

$4y-2=90$

$+2 \quad +2$

$\frac{4y}{4} = \frac{92}{4}$

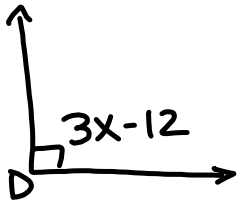
$y=23$



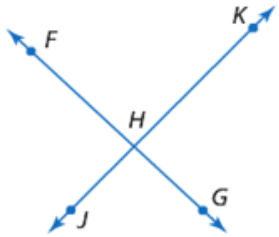
complementary

ex. 4. Suppose $m\angle D = 3x - 12$. Find x so that $\angle D$ is a right angle.

$$3x - 12 = 90$$
$$+12 \quad +12$$
$$\frac{3x}{3} = \frac{102}{3}$$
$$x = 34$$



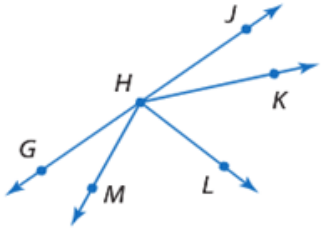
In the figure at the right, it *appears* that $\overleftrightarrow{FG} \perp \overleftrightarrow{JK}$. However, you cannot assume this is true unless other information, such as $m\angle FHJ = 90$, is given.



In geometry, figures are sketches used to depict a situation. They are not drawn to reflect total accuracy. There are certain relationships that you can assume to be true, but others you cannot. Study the figure and the lists below.

KeyConcept Interpreting Diagrams

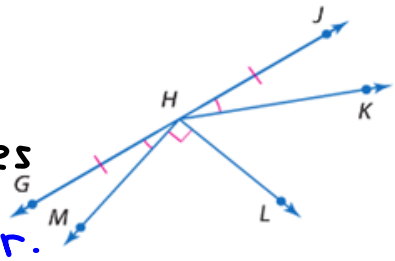
CAN be Assumed	CANNOT be Assumed
All points shown are coplanar.	Perpendicular lines: $\overleftrightarrow{HM} \perp \overleftrightarrow{HL}$
G, H, and J are collinear.	Congruent angles: $\angle JHK \cong \angle GHM$
$\overrightarrow{HM}$, $\overrightarrow{HL}$, $\overrightarrow{HK}$, and $\overleftrightarrow{GJ}$ intersect at H.	$\angle JHK \cong \angle KHL$
H is between G and J.	$\angle KHL \cong \angle LHM$
L is in the interior of $\angle MHK$.	Congruent segments: $\overline{GH} \cong \overline{HJ}$
$\angle GHM$ and $\angle MHL$ are adjacent angles.	$\overline{HJ} \cong \overline{HK}$
$\angle GHL$ and $\angle LHJ$ are a linear pair.	$\overline{HK} \cong \overline{HL}$
$\angle JHK$ and $\angle KHG$ are supplementary.	$\overline{HL} \cong \overline{HG}$



The list of statements that can be assumed is not a complete list.
There are more special pairs of angles than those listed.

ex. 5.

Determine whether each statement can be assumed from the figure. Explain.



a. $\angle KHJ$ and $\angle GHM$ are complementary.

NO, we don't know their measures

b. $\angle GHK$ and $\angle JHK$ are a linear pair.

yes, definition of linear pair.

c. $\overrightarrow{HL}$ is perpendicular to $\overrightarrow{HM}$.

Yes, because m∠MHL is 90°.